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GEOGRAPHY

How You Can Prove Columbus' Theory

Next Wednesday, October 12, we celebrate the 435th anniversary of the discovery of the New World by Christopher Columbus. To most of us, the name of Columbus automatically suggests the idea that the earth is round, which was the basic theory on which his voyage was undertaken. In our early school days we were taught that at the time the great admiral found a new continent everybody in Europe thought the earth was flat and that if you sailed far enough you would fall off into outer space. Like many of our childhood notions, this is not correct. Centuries before Columbus discovered America and before Magellan proved that the earth was round by sailing around it, students of the subject quite generally believed in the earth's rotundity. They did think, however, that the earth was at the center of the universe and that the sun revolved around it. After Copernicus published his book on "The Revolution of the Celestial Orbs" in 1546 his ideas naturally came into wide acceptance, and now like him we believe that the sun is at the center and the earth revolves around it. In the time of Columbus there may have been people who thought that the earth was flat, but they were not the scientists of the day.

We now know that the earth is a figure that the mathematicians call an oblate spheroid. This is a figure approximately the shape of a door knob or an onion. However, for practical purposes the earth is a sphere, because its diameter at the equator is only a few miles greater than that from pole to pole. The slight additional distance at the equator is due to the earth's rotation. When you swing a stone on the end of a string around your head it tries to fly away. In the same way the part of the earth at the

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COLUMBUS' NAVIGATING INSTRUMENTS would be considered crude nowadays; but they were the latest word in 1492, and in using them the great discoverer plotted out his course on the assumption that the earth is a sphere

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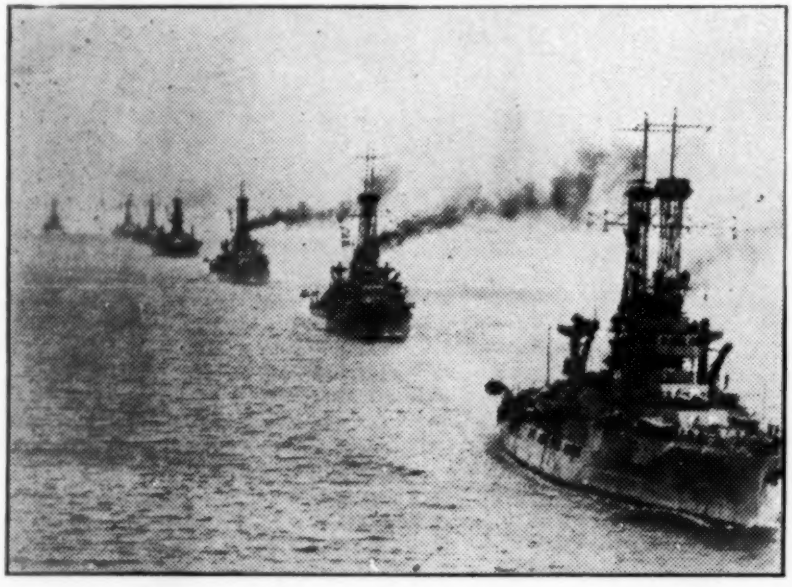

WHEN THE FLEET COMES IN the ships seem to climb a low, round hill, for the masts and smokestacks rise over the horizon before the hulls appear

How to Prove Columbus' Theory

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equator tries to fly away from the center as it is swung around once every day.

But what are the proofs that the earth is round and that it is rotating? Of course one was furnished by the navigator Ferdinand Magellan when he sailed around it, but if the earth were flat, and large enough, it is conceivable that a boat might sail in a large circle and yet the captain would think he was sailing in a straight line. That might have have been true at the time of Magellan, but with the modern sextant, radio and other means by which modern sailors determine their position when at sea, such a mistake is hardly possible.

Recent achievements in aviation have furnished striking proof. When Commander Byrd flew straight from New York to France despite almost constant fog he again demonstrated the accuracy of modern navigation. Again, when Maitland and Hagenberger flew to the Hawaiian Islands, where only a slight deviation from the path would have carried them beyond their goal to possible death, they also showed how trustworthy are our ideas of the shape of the earth.

Proof By The Great Circle

The very routes taken by the trans-Atlantic and trans-Pacific flyers depend upon the rotundity of the earth.

On a flat earth the shortest distance between two points would be a straight line. To everyone familiar with ordinary maps, it would seem that the quickest way to get from New York to Paris would be to fly almost directly east. Most of us were surprised when Lindbergh, instead of going by this apparently direct route, went first from New York to Newfoundland and followed a track along a great northward-curving arc. The shortest distance between two points on a

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PSYCHOLOGY

Skin Registers Emotions

"Thin-skinned" and "thick-skinned" as popular estimates of the emotional reactions of an individual have taken on a new meaning as the result of the researches of Dr. David Wechsler, well-known psychologist of New York. Only the thinness or thickness applies not literally, but as an expression of the conductivity or resistance of the skin to slight electric currents. For in Dr. Wechsler's laboratory the skin has been found to be a delicate emotional barometer, greatly increasing its resistance to the passage of electricity when one is quiescent, but permitting the current to go through much more readily when the feelings are even moderately aroused.

Of all the tissues of the body, the skin is one of the best insulators. The flesh and blood within conduct electric currents very easily, but the skin serves as a protection against these as against many other external vicissitudes. But like all non-conductors, it offers much less resistance when it is moist.

It is of this latter fact that the New York psychologist has taken advantage. It is common knowledge that we perspire, sometimes very heavily, under severe emotional stress. The cold sweat of fear, the flushed, damp face of anger, are familiar examples. But even less extreme emotions, it has been found, cause a less perceptible but still unmistakable moistening of the skin.

Dr. Wechsler's procedure is simple. He includes a part of his subject's skin in an electric circuit by having him dip his hands, or even merely two fingers, in salt solutions in which two wires end. In the same circuit he includes a sensitive instrument to detect and record changes of the current.

So long as the subject is sitting still and thinking of nothing in particular, the indicator hangs motionless. But if a sentence is spoken, or an object or picture shown, which arouses his interest, anger or fear, the indicator instantly jumps upward, indicating an increase in the amount of current which has passed, corresponding to a decrease in the resistance of the skin.

One of the first suggestions made for the use of this method was of its possible value in criminology. Naturally a criminal would have a rather marked emotional reaction if some one suddenly snatched away a

(*Just turn the page*)

CHEMISTRY

The Secret of Synthetic Petroleum

By Edwin E. Slosson

Current discussion in the newspapers of the combination of the Standard Oil Company of New Jersey with the German Dye Trust for the production of synthetic petroleum has made the American public realize for the first time that constructive chemistry has reached a point where it is to be taken seriously in this field. We had heard for some time rumors that the Germans were experimenting in methods for making artificial motor fuel but then we should expect German scientists to fool around with such a visionary idea. We could understand also why the British, since they had no oil of their own, should take an interest—even a financial interest—in such projects.

But why should we, when our petroleum output had reached an unprecedented height and still had not passed its long-predicted peak, when the oil was pouring from the ground faster than it could be barreled and sold, when Congress is being called upon to put a stopper on our overflowing wells—why should we concern ourselves with the development of a difficult, expensive and untried process for converting coal into coal oil? A patent for the making of gasoline and other things from coal was among the mass of German patents taken over by the Alien Property Custodian when we entered the war and placed in the hands of the Chemical Foundation for the employment of any true-blue American, but nobody cared to call for it.

But now when we see that the very men who are most active in handling natural petroleum are acquiring the rights for making its synthetic competitor, our papers are full of wonder-why editorials. Two kinds of answers are prominent: first, that Standard Oil is preparing for the future when the fluid fossil fuel that we are drawing upon so unwisely and using so wastefully will begin to run out; second, that the process concerned has an immediate application to the working up of heavy oil residues and distillates, asphalts and tars, into gasoline and other valuable products such as alcohols.

Which of these surmises is the main object cannot be determined by the public since the particular process to be employed is still a secret. It is known to be based upon the method for the liquefaction of coal developed by Dr. Friedrich Bergius of Heidelberg, but it is said to involve the use of some unknown catalyst. "Catalyst" is the name given by chemists to a substance which promotes by its mere presence the desired reaction. In this case, for instance, the catalyst may serve to facilitate the joining of the carbon atoms of the coal with the hydrogen atoms from water to form gasoline, somewhat as the brakeman on a train couples together the cars. The original Bergius process was distinguished from its rivals by dispensing with any catalyst and forming the union between carbon and hydrogen by employing high temperature and pressure alone. But apparently for certain purposes that we can only surmise some catalyst is found a useful aid.

The first step in the effort to solve the mystery of the unexplained catalyst is to make a search of the patents recently applied for by the I. G., the combine of chemical industries commonly called the German Dye Trust. One of the catalysts specified is sulphur. Now sulphur is found frequently in coal and oil, where it is regarded as objectionable. For many years the petroleums of some of our richest fields were rejected as unusable because of their sulphurous smell until finally a way was found to eliminate the obnoxious ingredient. It would be funny if the element the chemists worked so hard to get rid of should turn out to be so useful that it is added where wanting. It might be added in the unpleasantly familiar form of hydrogen sulphide which would carry the necessary hydrogen as well.

The high cost of free hydrogen has been regarded by outsiders as an obstacle to the process, but it has been recently revealed that this element may be introduced in the form of steam, or of methane, which occurs in our natural gas or may be made artificially.

Among other catalysts mentioned in the I. G. patents are compounds of nitrogen. Now, nitrogen is also a common component of coal, or it might be introduced in the form of some synthetic compound manufactured from air. Other catalytic agents specified are the rare—or until recently unfamiliar—metals molyb-

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Synthetic Petroleum

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denum, tungsten and chromium, and their compounds, and so many other substances that it is impossible to guess which is to be most employed.

Dr. Bergius explained his process for the transformation of coal into oil before the Pittsburgh Conference on Bituminous Coal with remarkable freedom and frankness, but it was noticed by the audience that he said little or nothing about its catalytic possibilities. In the discussions of the conference several of the experts present tried to elicit his views on this crucial point. His final answer is worth quoting in view of the public interest now aroused on the subject:

"I only wish to have a word to avoid misunderstanding. I want to say that certainly catalytic action occurs also in coal hydrogenation. Yesterday the time was too short to give every detail on this complicated reaction, but I think I remarked at one point that there is catalytic action too, and we found that there are a lot of things, a lot of material, which helps catalytic action."

And he specified among the lot of things which modify the products, favorably or unfavorably, the composition of the ash, the presence of sulphur, iron oxide, alkaline compounds of the carbolic-acid group, and a German synthetic substance known as tetraline, made from naphthalene (well known as mothballs) by the addition of hydrogen. This, he said, "showed the catalytic effects which we know and which will play quite an important part in developing special lines of this process in making the output better." We may surmise that it is among these "special lines" of catalytic action that we may expect the developments which the world awaits.

The same question that is now under discussion, that is, whether the liquefaction of coal would pay in America, was put to the inventor at the Pittsburgh conference, and he replied that, since he had been in this country only a month and prices of labor are so varied, he could not be expected to give an accurate estimate but he ventured the guess that the cost of a ton of finished products here would be about $10.00, not counting the price of the coal used as raw material.

Skin Registers Emotions

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curtain, revealing the corpse of his victim. But the apparatus can measure reactions much more delicate than that, it is stated.

In one experiment a mathematical problem was set before a mathematician, and his conductivity curve rose to a peak, where that of an ordinary person would not have come out of its regular straight line.

In another test, a number of machine operatives were examined together, and their sensitivity as measured by the apparatus was found to run closely parallel to their known records of comparative skill.

Marine animals contain zinc, and generally small amounts of copper in their bodies.

Employes of a Massachusetts electrical company play baseball at night on a brightly lighted diamond.

The principle of the thermometer was discovered by Galileo 87 years after Columbus discovered America.

CHEMISTRY

Street CO Menaces Children

Carbon monoxide poisoning from automobile exhaust gas is cited as a potential factor in the ill health of city children, by Dr. J. C. Sinclair Battley of Detroit in a forthcoming issue of the American Journal of Public Health.

Carbon monoxide, a colorless, almost odorless, highly poisonous gas, is known to be present in high concentration in the exhaust of automobiles. Babies and young children are particularly susceptible to this form of poisoning, so that the constant exposure to the varying amounts present in the atmosphere of city streets bearing heavy traffic Dr. Battley considers a possible source of the poor health, failure to gain, lack of appetite, and non-resistance to infection frequently seen in city children.

"Children are exposed to a great deal of exhaust gas," he declares. "In apartments on main thoroughfares where traffic is heavy, children are subjected to a constant stream of diluted exhaust gas rising from the lower stories through the building for a considerable part of the day. The poisonous effect is difficult to estimate because of the multiplicity of factors involved, but prolonged observation may bring substantial proof. In view of the fact that chronic poisoning has been observed in adults, there seems no reason why it may not be a factor in the ill health of children."

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ZOOLOGY

Heated Water Carries Fish

Continuously flowing, steam-heated sea water has enabled a cargo of scarlet star fish, jazz fish and huge red hermit crabs to travel in luxury from the Madeira Islands to the London Zoo.

Between 80 to 90 exotically colored specimens have been successfully transported from their native haunts and added to the marine collections by E. G. Boulenger, director of the Aquarium. Since these types require a constant temperature and water abundantly aerated, specially constructed containers were required to bring them to their destination alive. A large wooden tank was divided into compartments and fitted up with steam pipes. Fresh water was pumped into the tank continuously which the steam pipes held at a constant temperature.

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PSYCHOLOGY

LEWIS MADISON TERMAN

Investigator of Genius

One of a nation's most precious resources is its gifted individuals, says Dr. Terman. This thought has been expressed by wise men of earlier times, but the modern psychologist is the first to take it seriously, since he is the first to look into the possibilities of developing those resources and preventing them from going to waste.

Dr. Terman's study of 1,400 unusually bright school children has demonstrated that the typical gifted child is different from average children, and can usually be spotted at an early age. His investigations have produced evidence to show that the bright and talented children of the race are not sickly and queer. Their superior mentality is most likely to go hand in hand with good physique and nervous stability and a wide range of interests. This is a beginning at understanding the principles of genius, but the gifted child is still so little understood that he represents the "Darkest Africa" of educational exploration, Dr. Terman declares. Methods of training the dull child have been carefully studied in recent years, but geniuses still have to develop their gifts as best they can without assistance from science.

This psychologist's studies of genius are a natural outgrowth of his studies of intelligence. Some 20 years ago, he was impressed by the possibilities of the Binet intelligence tests for measuring the differences between children, and his revision of the Binet-Simon test helped to establish the intelligence test as an educational institution. Later, he rendered valuable assistance in the problem of measuring the intelligence of the U. S. Army during the War.

His flair for pioneering in big, almost totally unexplored fields of psychology has most recently led him to investigate the differences between the sexes in talents, abilities and character.

Dr. Terman is a Hoosier by birth (1877), and by education at Indiana University. He came east to win his Ph. D. at Clark University, and then crossed the country to California, where he has taught and conducted research almost ever since. At present, he is head of the department of psychology at Leland Stanford Junior University.

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METEOROLOGY

Chumming With Tornadoes

The man who has had more personal experiences with tornadoes and has written more about them than anybody else in the world is Colonel John P. Finley, a retired officer of the United States Army. He was a lieutenant in the Signal Corps in the days when that branch of the Army conducted the meteorological service of the country, now carried on by the Weather Bureau. In the early eighties he was placed in charge of the field investigation of tornadoes and other violent local storms, with headquarters at Kansas City. He organized a corps of 2,500 tornado reporters representing every state and territory in the Union, from whose records he assembled a remarkable fund of information concerning the deadliest storms on earth.

On one occasion he was driving over the prairie when he saw unmistakable signs of a coming "twister" on the western horizon. He stopped at a farmhouse, where he found a woman preparing supper. Briefly explaining the danger he instructed her to put out the fire, and aided her in doing so. He then rounded up other members of the family, who were out in the fields, and assembled them all in the southwest corner of the cellar. Hardly had they reached this refuge when the bellowing monster reached the spot, lifted the entire house from its foundations and set it down, almost intact, in an adjoining field. Nobody in the cellar was injured. That night the farmer's family slept in their house, which was still habitable despite its change of location.

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JOSEPH McCABE
Guest Editor

JOSEPH McCABE is well-known to readers of the Haldeman-Julius Publications as a scholar, lecturer and writer. He has just completed a series of fifty Little Blue Books embodying the conclusions of many years of study. His industry has been unceasing, his zeal for knowledge unflagging—in short, he is the ideal person to edit and write "The Key to Culture," which is publishing all the knowledge a person should have to be well-informed. He has been a professor of philosophy, a popular lecturer and writer on science for twenty years, translator of important works on economics, Einstein, etc.

"I have taken all knowledge for my province."
—Francis Bacon

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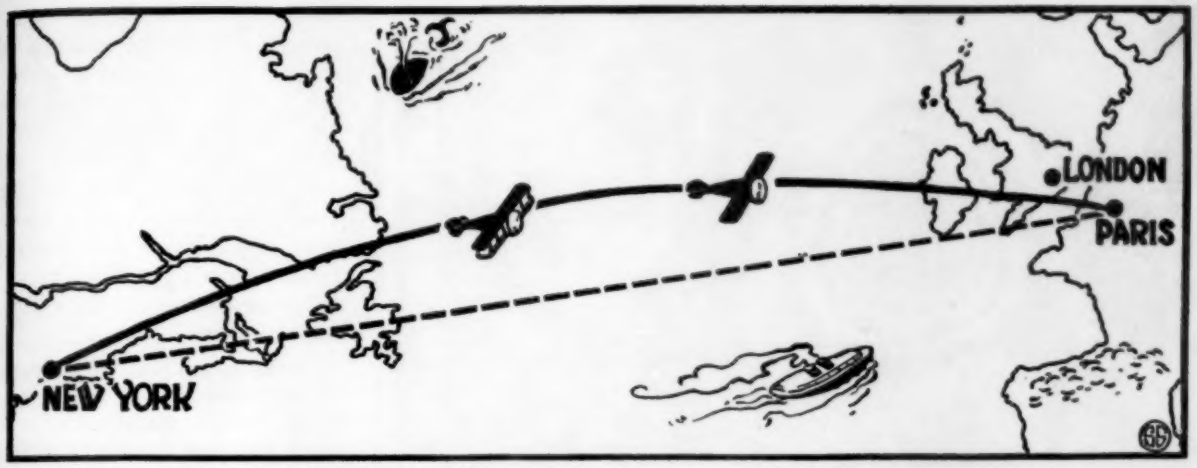

THE PARADOX OF THE GREAT CIRCLE: If the earth were flat, a "ruler line" would be the shortest distance between two points, but on the surface of a globe a curved line is. Hence the northward swing of Lindbergh and the other trans-Atlantic fliers

How to Prove Columbus' Theory

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sphere is what the navigators call a segment of a great circle.

Any one can test out the "great circle" idea for himself. It requires merely a globe and a tape measure or a piece of string. If a regular geographical globe is not available any large sphere—a basketball for example—will serve fairly well. Of course, the bigger your sphere the better your results will be. Just hold down one end of your string at New York, and stretch it to Paris, pulling it tight, to make the span with the shortest length possible. You will find that it automatically lays itself out along the curious curved path followed by Lindbergh and all the other fliers who have followed him. If you try to lay the string along a "ruler line" such as could be drawn on a flat map (or a flat earth) you will find that it lies slack, and is noticeably longer than the "great circle" line. The only place on the globe where a straight east-and-west line is also the shortest way to get there is right on the equator.

Stars Prove Rotundity

There are other proofs that the earth is round. One of the most striking is that afforded by the changes in the stars as we go south. The Great and Little Bears, the Pole Star, and the familiar big "W" in Cassiopeia are all conspicuous objects in our night sky.

But if we were living in South Africa or New Zealand we would never see these stars. In their place we would see such constellations as the Southern Cross, the Southern Triangle and the Centaur. None of these are visible at all from the northern part of the United States and only a few of them can be seen low in the south at certain seasons of the year from the southern part of our country. At a point on the equator both the southern and northern constellations are visible at certain times, but the pole star is never more than barely above the northern horizon.

This could not possibly be the case if the earth were not round. The stars are scattered around the earth in all directions as if they were located on the surface of a huge sphere. We know of course that they are not, but instead are at distances ranging from relatively close to infinitely far away. However, for convenience the astronomer often considers them as if they were all on a huge celestial sphere. If the earth stood still in space we would only be able to see about half of the stars from any one place because the rest would be continually below the horizon. As it is the movement of the earth brings certain constellations into view at various times of the year which are not seen at others. The farther north they are the more continually are they visible.

The Little Bear, of which the Pole Star is a member, never sets below the horizon for people in the United States. Like all the stars it appears to revolve around the north pole of the heavens, but even when it is lowest it is still above the horizon. A star group such as Orion which is approximately on the celestial equator, and is always over some point on the equator of the earth, is visible in the evening for about half of the year.

A group still farther south may only be visible in the evening for a month or two. Such a constellation is the Southern Fish. The bright star of this group, called Fomalhaut, is seen low in the south in the early winter evenings. Still farther south are the constellations which revolve within about forty degrees of the south pole of the sky. These never rise high enough to be seen in the United States. If the earth were flat we would see the same stars in the sky above us whether we were at one side of it or another.

But there are still further astronomical proofs that the earth is round. If we could get on the moon we would see the earth from such a distance that it would look round. Of course this is not possible, but the earth does cast a shadow out into space. At the time of an eclipse of the moon the earth's shadow falls upon the lunar disc. At such times we can actually see the outline of the earth and we can see that it is always round.

Sea Shows Curvature

A more familiar proof is accorded by watching ships going to sea. When the ship is close by, it is seen in its entirety. Then as it reaches the horizon the lower part of the hull vanishes over the edge of the horizon even if we have a telescope to watch it. Gradually the whole hull vanishes. Finally only the upper part of the smokestack or mast is left and then the ship has disappeared completely and only the smoke shows its location. But if one then quickly climbs a hill or ascends a high tower, the ship again becomes visible, because the greater height of the observer enables him to see over the curve of the earth.

With the sextant the sea captain finds the height of the sun above the horizon at noon and from this figure he calculates his position.

(*Just turn the page*)

STARTING THE FOUCAULT PENDULUM in the building of the National Academy of Sciences and the National Research Council at Washington; this instrument demonstrates the rotation of the earth

How to Prove Columbus' Theory

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Because the bridge may be as much as 30 or 40 feet above the surface of the water the horizon is a trifle lower than it would be if he were right at the surface or standing in a lifeboat. This difference is quite small. If the sextant is 36 feet above the water the horizon would only be about six minutes of angular distance lower than if it were at the surface. Six minutes is about one-fifth of the apparent diameter of the full moon. At sea the captain uses tables of the dip that have been prepared according to the generally accepted figures and ideas of the shape and size of the earth. If these were in error it is inconceivable that ships could be navigated as accurately as they are.

The Earth Rotates

The earth is more than a sphere floating in space. It is a rotating sphere. Once in twenty-four hours the earth revolves from west to east. This causes the heavens to move apparently from east to west and brings us sunrise and sunset. But how can this be proved? Before the time of Copernicus men believed that the earth stood still and that the heavens revolved around it. The only argument that Copernicus could bring in favor of the rotating of the earth was that it would be much simpler to have the relatively small earth revolve instead of the vast sphere of stars. However, all the phenomena that had been observed up to that time could be equally well explained if the earth or the heavens turned around.

Proof of the Pendulum

The first experimental proof that the earth actually turned was performed in 1851 in Paris by the famous physicist Foucault, with a pendulum consisting of a heavy ball hung on a long wire. This has been repeated in many places, and today at Washington, in the new building of the National Academy of Sciences, a Foucault pendulum is kept in regular operation.

The principle is this. If a pendulum is arranged to swing freely in any direction, unlike the pendulum of a clock which is designed to swing in one place only, it will continue to swing in the same direction even if the support is turned around. If such a pendulum were suspended over the North Pole and started swinging it would continue to swing in the same direction even though the earth were turning under it. To a person standing beside the pendulum, not aware of the motion of the earth, the plane in which the pendulum swung would seem to turn from east to west. Actually it would be the pendulum that was standing still, however, and the observer that was turning.

If the pendulum were set up at the equator, the effect would not be the same. The pendulum would not work because the earth would not be turning under it. The whole pendulum would be carried around in a circle. At a point any place between the equator and the north pole the pendulum would seem to turn around, taking more than a whole day. The one in Washington takes about 36 hours. It moves in the direction of the hands of a clock, in the same direction as the shadow of an upright stick moves during the day. At a point in the southern hemisphere as far south of the equator as Washington is north of it, the pendulum would also turn once in about 36 hours. Here, however, the movement would be in a counter-clockwise direction.

Pendulum Easily Duplicated

The Foucault experiment is an easy one to duplicate. Anyone with a little ingenuity can set up a pendulum so that it will swing freely in any direction. The longer the wire or cord supporting the weight is, the better. In Paris Foucault used a wire over two hundred feet long. A shorter wire can be used, however, and if a heavy weight is used the effect can be noted. In order to start the pendulum without giving it a push to one side or the other, Foucault pulled it to one side with a thread. Then he burned the thread with a match. This allowed it to swing without any tendency of its own to turn. To tell how it seems to turn by the motion of the earth he attached to the bottom of the ball a metal point. Each time the pendulum swung to one side, this point plowed through a ridge of sand. Each time the groove left in the sand would be a little farther in a clockwise direction than the previous one. Such a system might be used in a home-made Foucault pendulum, and if it is kept free from draughts of air, one will be able actually to watch the earth turning.

AGRICULTURE

Too Many Grapevines

Prohibition-induced prosperity is threatening to become too much of a good thing for vineyard owners in California. Serious overproduction of grapes is in prospect, in spite of an ever-increasing demand by Eastern home wine makers. A newly issued bulletin of the California Agricultural Experiment Station here, written by S. W. Shear and H. F. Gould, is devoted to a discussion of the economic status of the grape industry in California.

"The rapid expansion of the grape industry in California as compared with the rest of the United States has been primarily the result of prohibition, which caused a sudden and great reduction in the utilization of wine grapes by California wineries and a gradual but tremendous increase in eastern consumption of fresh wine and raisin grape varieties for juice purposes," the economists state. "Before 1915 practically none of the grapes shipped from the state were designed for wine making. By 1921, however, almost 20,000 carloads of juice stock were shipped, and in the last two years an average of nearly 50,000 carloads, or approximately 70 per cent of California's grape shipments have been juice stock."

The many varieties of grapes grown in California can be divided into three main main classes, wine, raisin and table grapes, according to the uses for which they were bred. However, the authors state, a considerable proportion of the raisin and table varieties are now diverted to wine making, in addition to the entire wine grape crop.

The great demand by the Eastern market for grapes has led, as might have been expected, to a large increase in vineyard acreage, both in California and in other states adapted to vine culture. The Great Lakes states, particularly New York, furnish heavy competition in certain types of grapes. The Ozark region in Arkansas has also developed into a great vineyard country. Finally, California's next-door neighbor, Arizona, has taken to raising grapes of types very similar to California's own.

The two economists recommend a curtailment in new acreage, and better cultivation practices to cut production costs, as means for keeping prices at a level that will show a profit for the grower.

Science News-Letter, October 8, 1927

PALÆONTOLOGY

Hall of the Dinosaurs

Fierce hunters of the elder day,
The tiger lizards of old time,
The vast forms of the ancient slime
Long ages since have gone their way.
The fierce destroyer and the prey
Lay down together in their doom.
Now they foregather in this room
Like uncouth specters brought to bay.

Yet once these monsters breathed and walked
And little monsters followed them,
Unwieldy nightmare cubs that stalked
Bewildered by the fallen stem
Of some great fern. And crude beasts heard
The dawn song of the first toothed bird.

—Gordon Lawrence.
(From the New York Times)

Science News-Letter, October 8, 1927

MEDICINE

Analyzes Tuberculosis Germ

Chemical analysis of the germ that causes tuberculosis has led to the discovery of a new type of compound, a phosphorus-containing fat, which has peculiar biological properties, according to Prof. R. J. Anderson of the department of chemistry at Yale University.

The tuberculosis bacterium is unique among single-celled organisms in being the possessor of a waxy covering which renders it highly resistant. This is why it can defy the phagocytes which police the body, for instead of being dissolved by them and destroyed, the T. B. organism survives and may multiply after being engulfed. The waxy sheath is so thick that it makes up one-fifth to two-fifths of the weight of the dried bacteria.

Prof. Anderson extracted eight pounds of the germs with a mixture of alcohol and ether to dissolve out this waxy coating. He obtained a pound of wax, half a pound of fat proper, and half a pound of phosphatide or phosphorus-containing, fat-like substance. The last material, to which he has given the name phosphosucride, is the most unusual constituent of the germs. It has been shown to contain phosphoric acid, a sugar, and fatty acids. "This compound differs from all other known phosphorized fats," Prof. Anderson stated. "It may be expected to have peculiar biological properties."

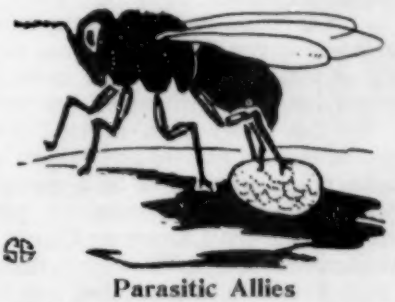
Science News-Letter, October 8, 1927

A Roman physician of about 50 A. D. prescribed change of climate, rest, and milk drinking for tuberculous patients.

BIOLOGY

NATURE RAMBLINGS

By Frank Thone



Parasitic Allies

In his endless warfare against the insects that threaten to destroy his crops and forests, man has learned to depend to a large and ever-increasing extent upon friends within his enemies' camp. Indeed, when we speak of our warfare against the insects, we commonly talk as though all the devouring pests were consciously leagued against us. Of course, that is not the case. Our plants are simply the objects of attack by swarms of separate creatures who can have no remotest notion that they are all working against a single species. They are simply hungry insects, and here is something to eat, and that is all there is to it.

Similarly, our insect allies do not know that they are allies, or that they are playing the part of traitors to their own phylum. Here is a caterpillar, or egg, or full-grown beetle, that will yield food for their hungry offspring when these hatch. But they are not even conscious that there are going to be any offspring. The prospective mother-wasplet or other predatory insect simply responds to an instinct (whatever that may be!) that impels her to lay her eggs on this caterpillar, or egg, or full-grown beetle, and will not permit her to lay them anywhere else. Then she goes her way and forgets about it. Usually, having finished her natural life cycle, she calmly crawls into a corner and dies. The whole thing is done with a mechanical blindness that is not a little terrible.

Science News-Letter, October 8, 1927

Authority on the one hand, a pillar to lean against, and sympathy on the other, a bosom to weep into—these are the chief demands of humanity.

—David Starr Jordan.

Science News-Letter, October 8, 1927

Long distance aviators should know enough about astronomy to use the stars as guides, says a Cornell professor.

How to Use Key-Word Feature of News-Letter

In order to aid in catching the items that concern you and to facilitate clipping and filing, a key word in small capitals has been printed on the right of the line above each article. The key words used fit into any system of classification, whether it be a straight alphabetical file, a system of your own devising, the Library of Congress classification or the Dewey system.

Note that you can clip out any article without fear of damaging another article in which you might be interested, since editorial matter printed on the right-hand pages is backed by advertising, standing matter or a continuation of the article on the other side.

Library of Congress Classification

The classification of the Library of Congress has come into common use in the libraries of the country owing to the publication by the Government of the card index of all new books. We print below a list of the subject titles which are most used in the SCIENCE NEWS-LETTER. The full scheme of classification is contained in "Outline Scheme of Classes," issued by the Library of Congress.

A General Works. Polygraphy.
B Philosophy.
BF Psychology.
G Geography, voyages, travel.
GA Mathematical and astronomical geography.
GB Physical geography.
GC Oceanology and oceanography.
GF Anthropogeography.
GN Anthropology. Somatology. Ethnology. Ethnography. Prehistoric archæology.
GR Folklore.
GT Manners and customs.
GV Sports and amusements. Games.
HC Economic history and conditions. National production.
HD Economic history. Agriculture and Industries.
HE Transportation and communication.
HF Commerce.
HM Sociology. General.
HQ Family. Marriage. Woman.
HV Social pathology.
L Education.
M Music.
N Fine arts.
P Philology and linguistics.
Q Science. General.
QA Mathematics.
QB Astronomy.
QC Physics.
QD Chemistry.
QE Geology.
QH Natural history.
QK Botany.
QL Zoology.
QM Human anatomy.
QP Physiology.
QR Bacteriology.
R Medicine. General.
S Agriculture. General.
SB Field crops. Horticulture. Landscape gardening. Pests and plant diseases.
SD Forestry.
SF Animal culture. Veterinary medicine.
SH Fish culture and fisheries.
SK Hunting. Game protection.
T Technology. General.
TA Engineering. General.
TC Hydraulic engineering.
TD Sanitary and municipal engineering.
TE Roads and pavements.
TF Railroads.
TG Bridges and roofs.
TH Building construction.
TJ Mechanical engineering.
TK Electrical engineering and industries.
TL Motor vehicles. Cycles. Aeronautics.
TN Mineral industries. Mining and Metallurgy.
TP Chemical technology.
TR Photography.
TS Manufactures.
TT Trades.
TX Domestic science.
U Military science. General.
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The main divisions of the Dewey Decimal Classification, used in many libraries and by many individuals, is given below for the convenience of those who wish to use this system:

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020 Library economy
030 General cyclopedias
040 General collected essays
050 General periodicals
060 General societies
070 Newspapers
080 Special libraries. Polygraphy
090 Book rarities
100 PHILOSOPHY—
110 Metaphysics
120 Special metaphysical topics
130 Mind and body
140 Philosophical systems
150 Mental faculties. Psychology
160 Logic
170 Ethics
180 Ancient philosophers
190 Modern philosopers
200 RELIGION—
210 Natural theology
220 Bible
230 Doctrinal. Dogmatics. Theology
240 Devotional. Practical
250 Homiletic. Pastoral. Parochial
260 Church. Institutions. Work
270 Religious history
280 Christian churches and sects
290 Ethnic. Non-Christian
300 SOCIOLOGY—
310 Statistics
320 Political science
330 Political economy
340 Law
350 Administration
360 Associations. Institutions
370 Education
380 Commerce. Communication
390 Customs. Costumes. Folklore
400 PHILOLOGY—
410 Comparative
420 English
430 German
440 French
450 Italian
460 Spanish
470 Latin
480 Greek
490 Minor Languages
500 NATURAL SCIENCE—
510 Mathematics
520 Astronomy
530 Physics
540 Chemistry
550 Geology
560 Paleontology
570 Biology
580 Botany
590 Zoology
600 USEFUL ARTS—
610 Medicine
620 Engineering
630 Agriculture
640 Domestic economy
650 Communication. Commerce
660 Chemical technology
670 Manufactures
680 Mechanic trades
690 Building
700 FINE ARTS—
710 Landscape gardening
720 Architecture
730 Sculpture
740 Drawing. Decoration. Design
750 Painting
760 Engraving
770 Photography
780 Music
790 Amusement
800 LITERATURE—
810 American
820 English
830 German
840 French
850 Italian
860 Spanish
870 Latin
880 Greek
890 Minor languages
900 HISTORY—
910 Geography and travels
920 Biography
930 Ancient history
Modern
940 Europe
950 Asia
960 Africa
970 North America
980 South America
990 Oceania and polar regions

Classics of Science: Fossils in Old Red Sandstone

THIS ANCIENT FISH, described below in a quotation from Old Red Sandstone, is reproduced from one of the illustrations in that book

THE OLD RED SANDSTONE; OR, NEW WALKS IN AN OLD FIELD. By Hugh Miller. Edinburgh: Johnstone and Hunter, 1841.

Although not every one can discover Devonian fishes in the course of his day's work, it will well repay anyone to study and identify his local geological formations.

Description of *Pterichthys oblongus Ag.*

Of all the organisms of the system, one of the most extraordinary, and the one in which Lamarck would have most delighted, is the *Pterichthys*, or winged fish, an ichthyolite which the writer had the pleasure of introducing to the acquaintance of geologists nearly three years ago, but which he first laid open to the light about seven years earlier. Had Lamarck been the discoverer, he would unquestionably have held that he had caught a fish almost in the act of wishing itself into a bird. There are wings which want only feathers, a body which seems to have been as well adapted for passing through the air as the water, and a tail by which to steer. And there are none of the fossils of the Old Red Sandstone which less resemble anything that now exists than its *Pterichthys*. I fain wish I could communicate to the reader the feeling with which I contemplated my first found specimen. It opened with a single blow of the hammer; and there, on a ground of light-coloured limestone, lay the effigy of a creature fashioned apparently out of jet, with a body covered with plates, two powerful-looking arms articulated at the shoulders, a head as entirely lost in the trunk as that of the ray or the sun-fish, and a long angular tail. My first-formed idea regarding it was, that I had discovered a connecting link between the tortoise and the fish—the body much resembles that of a small turtle.

My First Discovered Fossil

In the course of the first day's employment, I picked up a nodular mass of blue limestone, and laid it open by a stroke of the hammer. Wonderful to relate, it contained inside a beautifully-finished piece of sculpture—one of the volutes apparently of an Ionic capital; and not the far-famed walnut of the fairy tale, had I broken the shell and found the little dog lying within, could have surprised me more. Was there another such curiosity in the whole world? I broke open a few other nodules of similar appearance—for they lay pretty thickly on the shore—and found that there might. In one of these there were what seemed to be the scales of fishes, and the impressions of a few minute bivalves, prettily striated; in the center of another there was actually a piece of decayed wood. Of all Nature's riddles these seemed to me to be at once the most interesting, and the most difficult to expound. I treasured them carefully up, and was told by one of the workmen to whom I showed them, that there was a part of the shore about two miles farther to the west, where curiously-shaped stones, somewhat like the heads of boarding-pikes, were occasionally picked up; and that in his father's days the country people called them thunderbolts, and deemed them of sovereign efficacy in curing bewitched cattle. Our employer, on quitting the quarry for the building on which we were to be engaged, gave all the workmen a half-holiday. I employed it in visiting the place where the thunderbolts had fallen so thickly, and found it a richer scene of wonder than I could have fancied in even my dreams.

What first attracted my notice was a detached group of low-lying skerries, wholly different in form and colour from the sandstone cliffs above, or the primary rocks a little farther to the west. I found them composed of thin strata of limestone, alternating with thicker beds of a black slaty substance, which, as I ascertained in the course of the evening, burns with a powerful flame, and emits a strong bituminous odour. The layers into which the beds readily separate are hardly an eighth part of an inch in thickness, and yet on every layer there are the impressions of thousands and tens of thousands of the various fossils peculiar to the Lias. We may turn over these wonderful leaves one after one, like the leaves of a herbarium, and find the pictorial records of a former creation in every page. Scallops, and gryphites, and ammonites, of almost every variety peculiar to the formation, and at least some eight or ten varieties of belemnite; twigs of wood, leaves of plants, cones of an extinct species of pine, bits of charcoal, and the scales of fishes; and, as if to render their pictorial appearance more striking, though the leaves of this interesting volume are of a deep black, most of the impressions are of a chalky whiteness. I was lost in admiration and astonishment, and found my very imagination paralysed by an assemblage of wonders, that seemed to outrival, in the fantastic and the extravagant, even its wildest conceptions.

Experience of Half a Lifetime

My curiosity, once fully awakened, remained awake, and my opportunities for gratifying it have been tolerably ample. I have been an explorer of caves and ravines—a loiterer along sea-shores—a climber among rocks—a labourer in quarries. My profession was a wandering one. I remember passing direct, on one occasion, from the wild western coast of Ross-shire, where the Old Red Sandstone leans at a high angle against the prevailing Quartz Rock of the district, to where, on the southern skirts of Mid-Lothian, the Mountain Limestone rises amid the coal. I have resided one season on a raised beach of the Moray Frith. I have spent the season immediately following amid the ancient granites and contorted schists of the central Highlands. In the north, I have laid open by thousands the shells and lignites of the Oolite; in the south, I have disinterred from their matrices of stone or of shale the huge reeds and tree ferns of the Carboniferous period. I have been taught by experience, too, how necessary an acquaintance with the geology of both extremes of the kingdom is to the right understanding of the formations of either. . . .

Advantages of Wandering

One important truth I would fain press on the attention of my lowlier

(*Just turn the page*)

News-Letter Features

Born over five years ago of the demand and interest of those individuals who had caught a glimpse of *Science Service's* news reports to newspapers, the SCIENCE NEWS-LETTER has since proved interesting to laymen, scientists, students, teachers and children.

Into the pages of the NEWS-LETTER are fed the cream of *Science Service's* output directed at the newspapers of the world. To this is added material especially prepared.

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It is a *separable magazine*. You can clip or tear out any article without losing or damaging another article on the other side.

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The current *news* of science, reported for *Science Service* by its own staff and correspondents throughout the world is presented and commented upon in each issue.

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Regular articles tell of the happenings in the *skies* and in the great *outdoors*.

Photographs aid in the telling of the week's science.

Old Red Sandstone

(*Continued from page 235*)

readers. There are few professions, however humble, that do not present their peculiar advantages of observation; there are none, I repeat, in which the exercise of the faculties does not lead to enjoyment. I advise the stone-mason, for instance, to acquaint himself with Geology. Much of his time must be spent amid the rocks and quarries of widely separated localities. The bridge or harbour is no sooner completed in one district, than he has to remove to where the gentleman's seat or farmsteading is to be erected in another; and so, in the course of a few years, he may pass over the whole geological scale, even when restricted to Scotland, from the Grauwacke of the Lammermuirs, to the Wealden of Moray or the Chalk-flints of Banffshire and Aberdeen; and this, too, with opportunities of observation, at every stage, which can be shared with him by only the gentleman of fortune, who devotes his whole time to the study. Nay, in some respects, his advantages are superior to those of the amateur himself. The latter must often pronounce a formation unfossiliferous when, after the examination of at most a few days, he discovers in it nothing organic; and it will be found that half the mistakes of geologists have arisen from conclusions thus hastily formed. But the working-man, whose employments have to be carried on in the same formation for months, perhaps years together, enjoys better opportunities for arriving at just decisions. There are besides, a thousand varieties of accident which lead to discovery—floods, storms, landslips, tides of unusual height, ebbs of extraordinary fall: and the man who plies his labour at all seasons in the open air has by much the best chance of profiting by these. There are formations which yield their organisms slowly to the discoverer, and the proofs which establish their place in the geological scale more tardily still. I was acquainted with the Old Red Sandstone of Ross and Cromarty for nearly ten years ere I had ascertained that it is richly fossiliferous—a discovery which, in exploring this formation in those localities, some of our first geologists had failed to anticipate: I was acquainted with it for nearly ten years more ere I could assign to its fossils their exact place in the scale. . . .

Should my facts regarding it—facts constituting the slow gatherings of years—serve as stepping-stones laid across, until such time as geologists of greater skill and more extended research shall have bridged over the gap, I shall have completed half my design. Should the working-man be encouraged by my modicum of success to improve his opportunities of observation, I shall have accomplished the whole of it. It cannot be too extensively known, that nature is vast and knowledge limited, and that no individual, however humble in place or acquirement, need despair of adding to the general fund.

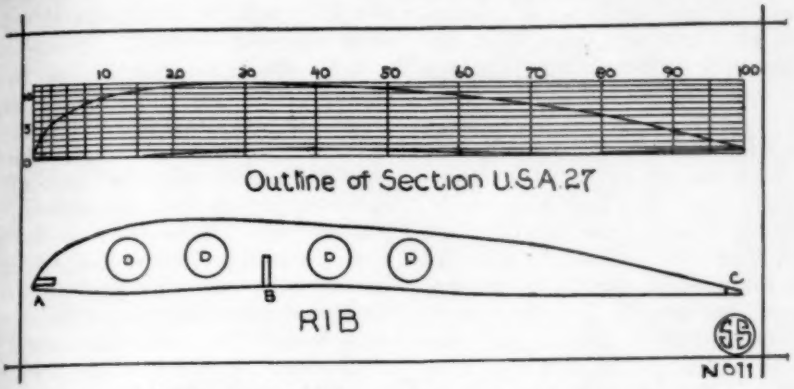
Hugh Miller was born October 10, 1802, at Cromarty in Scotland, and killed himself in Edinburgh December 23, 1856, after a year of illness. He was employed as a stone-mason from 1820 to 1834, during which time he studied the geology of the formations in which he worked, and spent his leisure time in writing poetry. For the next five years he was an accountant for the bank in Cromarty, and gained considerable fame as a writer. In 1839 he went to Edinburgh to edit the *Witness*, a Whig newspaper. The series of articles on the Old Red Sandstone appeared in that paper in 1840. Miller, although writing much of the "connecting links" between different forms of life, would have nothing to do with the evolutionary theories of "the ingenious foreigner," Lamarck. But Miller's discovery in the Old Red Sandstone of the Devonian fish fossils filled in an important step in the record of the rocks which was in his day rapidly taking the form which led to the generalizations of Darwin and his contemporaries only a few years later.

Science News-Letter, October 8, 1927

A South African company uses locusts to make poultry feed and fertilizer.

The coloring matter of butter is obtained by the cow from the plant carotinoids, the yellow color pigments of its food.

Building and Flying Model Airplanes



Making the Wing of SS-2

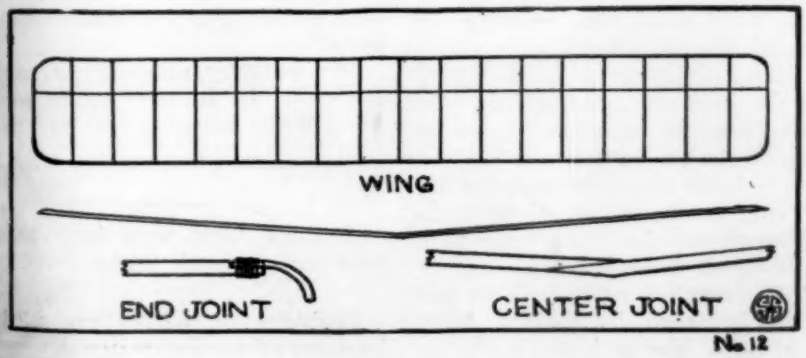
This is the eighth of a series of articles by Paul Edward Garber, telling how to make model airplanes. Mr. Garber is in charge of aeronautics at the Smithsonian Institution.

In the early days of aeronautical history airplanes were equipped with flat wings, but after a study of the anatomy of birds and of aerodynamics, the curved wing was adopted as being more efficient. Whereas the flat wings exerted a lift only because of the pressure on the under surface, it was found that curved wings in addition to the pressure on the bottom, utilized a vacuum on the top surface, and thus increased the wing efficiency. The next step was to find the most efficient curvature for the top surface, and what shapes of upper and lower surfaces produced the best results whether the object desired was speed, or lift, or combinations of these two factors. Thus there have been evolved many wing sections. When a new one is designed an accurately made pattern of it is placed in a sensitive balance in a variable air stream, and its actions noted. The results are published and are available to aircraft designers. The sections are given reference names and numbers such as Eiffel 15 or Clark-Y, meaning the number of the experiment conducted by that particular designer or laboratory.

One of the most efficient wing sections is the U. S. A.-27. When used in a wing it imparts to the airplane an excellent degree of speed and lift, with very little resistance. It has been used on many prominent airplanes, including the Douglas World Cruisers, which circumnavigated the world in 1924. We will use this section on our model.

The drawing shows the shape of this wing section. The upper drawing illustrates how the shape may be accurately copied. We will use a wing with a width of 5¼ inches, therefore on a sheet of paper draw a line this long. With a pair of dividers, divide the line into 10 spaces and number the divisions from 0 to 100 as shown. With the dividers still set at 1/10 of the line's length, extend them below the line and draw a line equal to the top line at this point. Divide the distance between the lines into ten spaces and draw a line across from each division, and add two lines equally spaced below the tenth. Next draw vertical lines downward from the marks 0 to 100. This practically completes the preparation for the drawing, but for the sake of better accuracy divide the first space in half and each of these again in half and finally the first of these smaller spaces, in half. The space between 90 and 100 is to be halved also. For clarity, you may mark these smaller divisions in the first space 1¼;

(*Just turn the page*)



St. Louis Tornado Typical

The tornado that devastated parts of St. Louis on September 29 was not an unusual storm from the standpoint of the meteorologist, except for the fact that it unfortunately occurred in a densely populated area.

Like most of the tornado disturbances for which the Mississippi region is noted, the recent storm left in the wake at least four affected localities, according to unofficial reports reaching the main office of the U. S. Weather Bureau at Washington. Tornadoes were reported at Muskogee, Okla., in northwestern Arkansas, at St. Louis, and near Danville, Ill. A line running northeast can be drawn through these places indicating that the general storm giving rise to the local tornadoes moved in this direction. This is another confirmation of the meteorological belief that the tornado storm travels from the southwest to the northeast.

The spinning whirls of destructive winds are not themselves in the center of the general storm giving rise to them. In the recent disturbance the "low" area where the barometer registered the least atmospheric pressure was somewhat to the northwest of the point of destruction. On the morning of the St. Louis tornado the "low" was in western Nebraska, in the evening, twelve hours later, it had moved to southeastern Minnesota and the next morning it was northeast of Lake Superior.

The most vicious storm on earth, exceeding in violence the tropical hurricane, the tornado is fortunately of short duration and covers only a small area of the earth's surface. At any one place the storm does not last more than a few minutes.

At St. Louis a wind velocity of 72 miles an hour was officially measured by the Weather Bureau station over a period of five minutes but it it probable that gusts at the storm center were much higher. From the destruction caused and the way bridges, houses and other heavy objects are handled by the wind, the velocities must reach 400 to 500 miles an hour in some tornadoes.

The cause of the tornado is essentially the same as that of a severe hail or thunder storm. From the west or northwest comes cold air which overrides warm, moisture laden air from the south or southwest. The surface of contact of the two winds is a slanting one, so that

(*Just turn the page*)

St. Louis Tornado Typical

(*Continued from page 237*)

about a hundred miles east of the trough, as the line of contact at the ground surface is called, the two winds clash at a height of about a mile. It is at about this point that the so-called funnel-shaped cloud usually forms, whirling like a top and carrying within it reduced pressure which causes houses in its path literally to blow up because of the released pressure within them. The warm air beneath, charged with moisture and immense energy, sets up a most violent convection and vertical overturning of the atmosphere which results in the typical tornado vortex, an immense eddy in the ocean of air.

Due to the limited area affected by the tornado and the impossibility of predicting just where it will occur, the Weather Bureau does not attempt to issue forecasts of these storms other than to warn of "severe local storms." If tornadoes were definitely predicted hundreds of thousands of people might be unnecessarily worried and the loss due to this condition might greatly exceed the damage that might be prevented.

About a hundred tornadoes occur each year in the United States, and they take a toll of about 300 lives yearly on the average. The tornado season for most of the country is from March to October.

Little can be done to protect against the tornado, but meteorologists give this advice:

If you see the tornado cloud advancing toward you, run northward or toward the northwest, in the direction of your left hand as you face the coming storm.

If there is a "cyclone" cellar or tornado cave, get into it as soon as possible.

In a frame house the best thing to do is to go to the southwest corner of the basement. A frame house is likely to be taken off its foundations intact.

In a brick or masonry structure, do not go to the cellar as that is the most dangerous place. The tornado will disintegrate the brick house at once, whirling the debris into the basement.

Science News-Letter, October 8, 1927

The oldest lighthouse in the United States, at Sandy Hook in New York Harbor, was first lighted in 1764.

The last entry in George Washington's diary, made the day before his death, was a short note on the weather.

Building Model Airplanes

(*Continued from page 237*)

2½; 5; and 7½, and similarly the next to the last subdivision may be marked 95. The horizontal lines are to be marked from 0 to 12, from the bottom up. The screen is now ready for marking the points of intersection of the wing outline.

To draw the upper and lower surface lines use the following table, wherein the first column indicates the vertical lines, the second column indicates the position on this line where the upper surface of the wing intersects, and the third column indicates where the lower surface of the wing intersects. For instance, the tabulation: 20—11, 1/3—1/3, means that on vertical line 20 a mark is to be made 1/3 of a space beyond the eleventh horizontal line and 1/3 of a space above the zero line to indicate where the upper and lower surfaces, respectively, cross. Using this method plot every position.

Vertical line	Upper surface	Lower surface
0	1 4/5	1 4/5
1 1/4	3 4/5	1/2
2 1/2	5 1/10	1/3
5	7	1/5
7 1/2	8 1/5	1/10
10	9 1/5	0
20	11 1/3	1/3
30	12	1
40	11 1/2	1 1/5
50	10 4/5	4/5
60	9 1/2	1/4
70	8	1/10
80	6	1/20
90	3 3/5	1/5
95	2	1/2
100	3/5	3/5

Connect the various marks which you have made on the screen and the resulting outline will be that of the U. S. A.-27 wing section.

Take the drawing which you have made and paste it on a piece of tin. With a pair of shears cut out the wing section, making a tin pattern. Next procure the following material:

1 sheet Japanese tissue paper, 38″ x 16″.

1 pc. pine wood 36″ x ¼″ x 1/16″.

2 pcs. balsa wood 34″ x ⅛″ x 1/16″.

1 pc. of bamboo, the remnant of that used for the wing.

18 balsa slats 5¼″ x ⅝″ x 1/16″.

Thread, Ambroid, banana oil.

On each of the balsa slats draw the outline of the tin pattern and cut out the rib. A cut should be made in the front and on the bottom of each rib to accommodate the front wing edge and the spar, as shown at A and B of the lower drawing. The rib may be lightened by making holes with a metal tube such as is used to hold the rubber on a lead pencil. Balsa wood is so soft that if the tube is placed on the wood and spun around the hole will be made, as shown at D in the same drawing.

The pine spar should now be cut in the center and rejoined as shown in the detail drawing above of the center joint. The angle formed should be such that the ends of the spar will be one inch above level. The ribs are now Ambroided to the pine spar, two inches apart. This should be carefully done so that all are in the same line. The front balsa edge is inserted in the front cut, and Ambroided in place. The rear edge is Ambroided directly to the rear of the ribs, as shown in the drawing at C. A piece of bamboo ⅛″ x 1/16″ x 9″ is curved to make the shape of the wing end. Bamboo may be easily curved by holding it in the heat of a candle flame, and forming it as the fibers give. This curved shape is carefully split in half, making two identical ends, and these are bound and Ambroided to the ladder-like frame as shown in the detail drawing of the end joint.

The wing is now completed and may be covered. To do this coat the top of the center sections with banana oil and over them lay the center of a piece of Japanese tissue paper, 38″ x 6″. Stretch the paper tightly over the frame, pulling it smooth to preserve the shape. Proceed with each section and finally fasten the paper snugly to the bamboo ends. The under surface is covered in the same manner. In all of these covering operations, pull the paper particularly taut along the length of the wing, in order to keep the curvature correct, and to prevent "saddles" between the ribs. If desired, the wing may now be painted with collodion or a thin solution of airplane "dope." Both banana oil and collodion are drug store articles. Airplane dope is sold by model airplane supply houses or by airplane dealers, advertised in aircraft magazines. It is thinned by adding acetone, which is another drug store article. This treatment of the paper tightens it and makes it more air-tight.

Lay the wing where it will not get distorted. In the next article we will describe the elevator for this model.

Science News-Letter, October 8, 1927

Canaries have been kept as pets since the sixteenth century.

Jawbones of whales are used by Eskimos as roofing material.

First Glances at New Books

THE HUMAN BODY—Logan Clendening—*Knopf*. There is more to this book than bones and blood. The anatomy and physiology are there, to be sure, accurate and complete; but the author has breathed the breath of life into its leaves, what with historical anecdote, and such illustrations as the picture of Vesalius stealing his first skeleton off a public gibbet, and pithily defended personal opinions. Thereby it becomes a book to be read, not merely one to be referred to.

Science News-Letter, October 8, 1927

THE NATURAL HISTORY OF A SAVANT—Charles Richet—Translated from the French by Sir Oliver Lodge —*Doran* ($2). The value of science and of scientific workers; the difficulties and uncertainties, the attempts and failures, through which a discoverer of new facts has to go set forth with humor and a unique style with conscious and much unconscious autobiography.

Science News-Letter, October 8, 1927

NOXIOUS GASES—Yandell Henderson and Howard W. Haggard—*Chemical Catalog Co.* ($4.50). One of the outcries against the Frankenstein monster of modern industrialism is that its breath poisons the air for those who labor beneath its mighty limbs. The tendency of practical humanitarians, of late days at least, has not been to seek the monster's destruction but rather its subjection, or at least to learn means whereby we may adapt ourselves to a world in which it has made a seemingly permanent place for itself. To this end the data collected into this compact but comprehensive monograph are admirably suited.

Science News-Letter, October 8, 1927

LABORATORY MANUAL OF GENERAL INORGANIC CHEMISTRY—M. Cannon Sneed and Raymond E. Kirk—*Ginn and Co.* ($1.20). This laboratory guide follows the order of chapters in Sneed's "General Inorganic Chemistry."

Science News-Letter, October 8, 1927

SOCIAL LIFE IN THE ANIMAL WORLD — Friedrich Alverdes — *Harcourt, Brace and Co.* A translation of a brilliant work by one of the leading professors at the University of Halle. It explores a field to which little attention has hitherto been paid, at least in English scientific literature.

Science News-Letter, October 8, 1927

ALL ABOUT ANIMALS—Lilian Gask —*Crowell* ($3). The author walks us through the zoo in strictly alphabetical order — from Aardvark and Bandicoot to Yak and Zoril, and tells us, in brief and breezy paragraphs, the main facts about the inhabitants of each cage or pen. Most of us have grown up with a vague feeling that our first Animal A. B. C's, while admirable so far as they went, were somewhat sketchy; here is an Alphabet Book that really completes the job.

Science News-Letter, October 8, 1927

PLANT ECOLOGY—W. B. McDougall—*Lea and Feabiger* ($3). A compact statement of the principles of plant ecology designed particularly for undergraduate classes; there has been a great demand for such texts and very few attempts to meet it. Appropriately for the purpose of the book, autecological problems receive the principal emphasis; though successions and community studies come in for their share of attention, and instrumental methods are briefly outlined.

Science News-Letter, October 8, 1927

INDUSTRIAL TRANSITION IN JAPAN —Maurice Holland — *National Research Council.* Japan in industrial metamorphosis is described in this little book by one who has studied the applications of science that are being made to the pearl fisheries, aviation, silk and other industries in the land of Nippon.

Science News-Letter, October 8, 1927

WEIGHTS AND MEASURES ADMINISTRATION—R. W. Smith—*Government Printing Office* (70c). This useful addition to the Handbook Series of the U. S. Bureau of Standards gives in condensed form information of use to public officers and all others interested in the marketing public's welfare.

Science News-Letter, October 8, 1927

NEMA HANDBOOK OF RADIO STANDARDS—*National Electrical Manufacturers' Association.* Any new and rapidly growing industry offers endless opportunities for capricious self-determination in definitions and methods that inevitably ends in paralyzing and exceedingly expensive anarchy. Such opportunities are redoubled when the industry is so highly technical as radio. This compact compilation, now in its third edition, offers standard definitions of new technical terms and accepted conventional symbols. It will do much to bring order where order is urgently needed.

Science News-Letter, October 8, 1927

GENERAL SCIENCE

The History of Science

By GEORGE SARTON

It is precisely because of the centrifugal tendencies of modern science that the study of the history of science is so useful. It helps the scientist, whom circumstances have obliged to restrict his attention to a relatively small subject, to eschew lopsidedness and other intellectual deformations and to keep alive within him a unitary view of knowledge. The scientist who has become unable to understand or appreciate other scientific activities than his own is but too prone to imagine his own studies are the very center of knowledge; in that respect he is on the same intellectual level as those ancients who believed that Delphi or Jerusalem was the navel of the world.

We may liken any science to a chain of facts which are linked together in an invariable order. Now, it has happened over and over again that various portions of such logical chains had been completed, but that the links connecting them are still missing. These links were eventually discovered, often by the help of scientific considerations of a radically new order, that is, borrowed from another science, and it was then possible to complete the whole chain in a rigorous and unexceptional manner. If such an event had happened but once, we might ascribe it to chance, but it has happened often that the probability of these occurrences being due to hazard is infinitely small, and we can draw no conclusion but this: *Science is one.*—Quotation from *Introduction to the History of Science. —Carnegie Institution of Washington.*

Science News-Letter, October 8, 1927

VETERINARY MEDICINE

X-Rays Diagnose Horse Ills

X-rays for horses are one of the latest advances in veterinary science that have given very satisfactory results at the Veterinary Station Hospital at Fort Sam Houston, Texas. They have been found most useful, it is stated, in making diagnoses of broken bones, ossifications and the presence of foreign bodies in the feet. As yet the curative effects of X-ray treatment have not been tried on horses at the Veterinary Hospital.

Since it is not feasible to bring such large animals into the X-ray room, an X-ray machine has been fitted up on a chassis with 18-inch wheels which conveys the apparatus directly to the patient's "bedside."

Science News-Letter, October 8, 1927